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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 19.] JULY. [1888.

LI.—BHABUR GRASS.

(*Ischæmum angustifolium*, Hackel.)

This grass, which closely approaches esparto in habit and in the possession of the technical qualities necessary for paper manufacture, was first brought into notice by Dr. King in the Annual Report of the Royal Botanic Garden, Calcutta, for the year 1877–78. It was there confounded with an entirely distinct plant, *Eriophorum comosum*, a species of *Cyperaceæ*, with which it often grows intermixed, and from which, as it rarely flowers, it is hard to distinguish. This error appears to have originated with Royle, who (Illustrations, p. 415) identifies *Bhabar* with *Eriophorum comosum* var. *cannabinum*. It was referred to in the Kew Report for 1878, p. 45, as follows:—

"*Eriophorum comosum*.—This plant is well known in North-Western "India, where, under the name of *Bhabar-ghas*, it is largely used as a "material for ropes. It was submitted by Dr. King to Mr. Routledge "(of the Ford Works, Sunderland), who writes to us:—'A small "'quantity of bleach brings it up to a good colour. The ultimate "'fibre is very fine and delicate, rather more so than esparto, and of "'about the same strength; the yield, however, is 42 per cent., some-"'what less. I think I may venture to say that it will make a quality "'of paper equal to esparto.'"

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1888.

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In the following year Mr. Duthie, Superintendent of the Government Botanical Gardens, Saharunpur, sent a specimen to Kew for identification. He wrote, May 2, 1879:—

"I am sending a specimen of a Cyperaceous-looking plant, which I " have been asked to identify. It is a native of the Nepal Terai, and " in the district of Gorakhpur, at the extreme east of these provinces. " Its native name is *Bankas*, and it is largely used in making ropes, " &c. It has been sent to me three times, but on each occasion " without flowers. It is said to flower only once in three years."

This recalled a grass which, under the name of *Bunkuss* appears, from the Bengal Catalogue of Indian products, to have been shown at the London Exhibition of 1862 (section 1, pp. 137, 168), as used in N.W. India for making ropes.

Mr. Duthie's specimens, though extremely imperfect, were submitted to the late General Munro, C.B., F.R.S., in the hope that his incomparable knowledge of grasses might enable him to ascertain what it was. He succeeded in identifying it with *Spodiopogon angustifolius* (Trinius in Act. Petrop. vi., ii., p. 300; Spec. Gram., t. 336). He added:—"It is *Andropogon involutus*, Steudel, and *A. notopogon*, " Nees and Steudel. It is mentioned by name only as *Spodiopogon* " *laniger* in Royle's Illustrations (p. 416). It is very common in all " parts of the Lower Himalayas; and I have seen it from Afghanistan, " collected by Griffith."

Mr. Duthie subsequently informed us that it was also known under the name of *Bhaib* grass, and that it was used for the manufacture of string matting and a variety of other articles, of which a fine collection was sent by him to the Kew Museum in 1880 (*see* Kew Report, 1880, p. 60).

We were indebted to Sir Dietrich Brandis, K.C.I.E., late Inspector-General of Forests to the Government of India, for pointing out that the grasses variously known as Bhabar, Bhaib, and Bankas were all identical. The following note upon the subject is contained in a paper entitled "Suggestion regarding Forest Administration in the " N.W. Provinces and Oudh" (Calcutta, 1882, pp. 7, 8):—

"The export of the grass known as Bhabar, Bhaib, Bankas " (*Andropogon involutus*, not as has often been erroneously stated, " *Eriophorum comosum*), from the Siwalik Hills, and from tracks of " broken raviny ground outside the Hills, is very considerable. . . . " The grass grows abundantly on dry bare slopes, and no apprehension " regarding the sufficiency of the supply need at present be entertained. " It is used chiefly for rope-making, and it is by no means impossible " that the establishment of paper-mills in North India will eventually " lead to the employment of this grass for the manufacture of paper."

Early in 1883 the India Office furnished us with a copy of a report by Mr. C. E. Edwards, the manager of the Lucknow Paper Mills, to the Director of the Department of Agriculture and Commerce of the North-West Provinces and Oudh, which contained the following observations with respect to the use of Bhaib for paper making:—

"This grass we have used here, but not to any great extent, owing " to the price being too high, besides the out-turn is not so great as " with jute. I found it not to yield more than about 35 per cent. of " paper. This is to a great extent owing to the top part of the " plant being somewhat perished, I presume owing to the tops being " more exposed to the atmosphere, as this part appears to get ripe " much earlier than the bottom. In the process of boiling the perished " or top part gets destroyed before the bottom part of the stem gets " sufficiently reduced to a pulp. This accounts for the great loss in the

" manufacture, but this could be obviated by having the top parts cut " off before despatching it to the paper mills, and if it could be had at " the same price with the tops off, I have no hesitation in saying it " would be a good and cheap enough fibre for paper-making purposes."

Dr. King, in his annual report for 1882–3, summed up its prospects as follows :—

" In several former reports I have referred to the leaves known by " the vernacular name *bhabur* as the produce of *Eriophorum comosum.* " I have now satisfied myself that the bulk of the *bhabur* used by " natives for rope-making is not derived from *Eriophorum*, as I have " supposed, but from *Andropogon involutus.* This grass, I find from " inquiry locally made, abounds in the hill parts of Behar and Chota. " Nagpore, where it is known as *Sabai.* From these regions it can be " obtained in quite considerable enough quantity to make its utilization " as a paper material a feasible project, and the people who actually " collect it sell it a reasonable enough rate. But in order to get it " brought to Calcutta in sufficient quantity for local manufacture, or " for shipment to Europe, middlemen have to be employed, whose ideas " of profit are pitched so high that, until they become modified, the " utilization of *bhabur* must remain in abeyance. This is only in accord " with the common experience in the Mofussil, that competition in " trade is not sufficiently keen to have much effect in keeping down " prices, but that, on the contrary, traders still form guilds banded " together to enhance prices, even at the risk of choking off demand."

On December 1, 1883, the late Mr. Thomas Routledge, who was always ready to assist us by making experiments on new paper materials, privately reported, as the final result of his trials of Bhabur grass :—

" I believe it will make a fair sheet of paper, much the same as fine " esparto ; in fact, in many respects, as a natural product, it closely " resembles esparto, but does not contain so much glutinous and " amylaceous matters, nor so much silica. The sample sent, you will " remark, was cut, and not pulled from the roots as esparto is. Like " esparto, *in situ* it is worth very little, and is used for similar purposes, " roping, matting, baskets, &c. The cost of esparto consists in " collection, carriage to port of shipment, and, latterly, baling charges, " freight to England, &c. Whether from India, with long and " probably costly inland carriage, with heavy freight added, it can " come into competition with esparto, is doubtful, and I do not think it " would pay to convert it into stock."

The prospect of utilizing the grass would be no doubt improved if it could be cultivated. From the following account by the Rev. H. P. Boerresen, of Rampore Hât (printed in the Proceedings of the Agricultural and Horticultural Society of India for October, 1887) it appears that this is readily practicable.

" (1.) The Sabai or Babui grass yields two crops in the year, one in " September, and the other at the end of October, or early in November, " without any irrigation, as the rainy season is then prevalent. It " might yield a third cutting if irrigated ; but I cannot say anything on " this head, never having made the experiment, nor have I seen it " attempted by others.

" (2.) I believe it will grow anywhere, as we have transplanted it " from here to all our other out-stations in the Santhal Parganas, and it " thrives in them all. The Santhal Christians have also taken some of " it to our Christian Colony in Guma Duar, Assam, where it also " grows well.

"(3.) I have never attempted to propagate it by seed, but always by "roots. When a clump or tuft is dug out, it may be divided into as "many small divisions of roots as one pleases, and these are put down "again in rows about three feet from one another, and the same "interval between each root planted. It will yield a very trifling "return the first two years, but by the third or fourth year, when the "roots have spread and multiplied, it gives a *good* crop. The plot on "which it is planted must be kept free from other grass. When it is "seven or eight years old, the roots should be beaten down with "wooden mallets, or a plough should be run through them in every "direction, and fresh earth thrown over the whole increases the yield. "If not treated in this way, it will cease yielding any crop. When "grown too old, it must be taken up entirely, re-divided in small "bunches of roots, and transplanted to a fresh locality.

"(4.) We brought the grass always in local *hâts* for roofing purposes "(*as rope*) before we grew our own, and nowhere in our neighbourhood "am I aware of its being cultivated in any but very small patches by a "solitary man here or there. It is not cultivated as a source of income "or trade, so that I am unable to say where the roots may be bought, "or at what price. We got a small quantity of the roots originally "from a Hindu village, but by fostering and spreading their cultivation "have now a considerable quantity. It should be planted in a *dry* "spot, where no water lodges, as experience has shown in one of our "stations, where the water oozed up from below and rotted the roots, "that it would not grow there. A sloping site is probably the best.

"When we first started the mission here we had to pay Rs. 4 a "maund in the *hâts* for the grass, in order to twist it into rope or "string, and it was the having to pay so much that led me to try and "cultivate it ourselves. The grass runs to seed in the hot months, shortly "before the rainy season, but these must be cut off and removed, or the "crop will deteriorate."

Besides a great variety of native names, Bhabur grass has, from the difficulty of exactly ascertaining its affinities, received an almost equal number of botanical ones. Under the name of *Pollinia eriopoda*, it is discussed in the Journal of the Linnean Society (vol. xx., pp. 409, 410), and it is figured and described in Hooker's Icones Plantarum (tab. 1773) as *Ischæmum angustifolium*, the name finally assigned to it by Hackel, the most recent monographer of Grasses. To the courtesy of the Bentham Trustees, we are indebted for the use of the accompanying plate.

LII.—CAYMAN ISLANDS.

The Cayman Islands consist of the Grand Cayman, Little Cayman, and Cayman Brac. They are situated in the Caribbean Sea, about 200 miles to the West of Jamaica, and are included under the Government of that Colony. Grand Cayman is 17 miles long, and varies in breadth from 4 to 7 miles. The coast is in some parts bold and rock-bound, but with no elevation exceeding 150 feet. The island is described as well wooded in parts and producing dyewoods and mahogany. The cultivated products of the soil are similar to those of Jamaica, and consist of cocoa-nuts, sugar cane, and ground provisions. Amongst the curiosities of Grand Cayman are a cave at Bodden Town, which extends some hundreds of yards under the sea, and a natural cistern of unknown depth, containing clear, sweet water, at a locality called East End. This cistern measures

M.S.del et lith

Ischaemum angustifolium, Hack.

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about 50 feet across, and is situated in the middle of a cliff of flinty rock.

Little Cayman is 9 miles long and about a mile broad. Cayman Brac is 10 miles long, and about a mile broad. Both these islands lie in a north-easterly direction from Grand Cayman, and distant about 70 miles.

The Cayman Islands are so far out of the regular traffic of steamers that they are seldom visited. The present population of Grand Cayman is about 4,000. Little Cayman contains only 35 inhabitants, while the population of Cayman Brac is said to be about 300 whites and 30 blacks.

It is a remarkable characteristic of the inhabitants of these tropical islets that they are a temperate, strong, tall, healthy-looking people, chiefly white or coloured. They are doubtless descended from the original settlers of the last century. The proportion of black people (negroes) is comparatively small.

The present Governor of Jamaica, Sir Henry Norman, has twice visited the Cayman Islands. On the occasion of his more recent visit [May 1888] he was accompanied by Mr. William Fawcett, F.L.S., Director of the Botanical Department, whose mission was specially connected with an investigation into a disease which has existed for some time amongst the cocoa-nut palms at Grand Cayman.

We understand that Mr. Fawcett is at present engaged in the preparation of an official report of his visit. In the meantime the following extract from a letter just received from him will afford a first impression of the vegetable resources of these lonely and little known islands :—

Jamaica, 21st May 1888.

I have just returned from a visit with the Governor to the Cayman Islands. We left Jamaica on 7th May, and reached Grand Cayman on the evening of the 8th. The next morning I went on shore, but the rain came down in such torrents that I could not do much. On the 10th I went about seven miles along the coast to the north, examining cocoa-nut palms at various places that were diseased. The next day I went along the south coast about 15 miles and back the same day, and had several diseased cocoa-nut palms cut down for examination. On the 12th I went inland about 2½ miles to the Sound, a shallow lagoon which runs in from the north side of the island, and on Sunday, 13th, did the same. On the 14th we left Grand Cayman, and touched at Little Cayman, landing for a short time, and then went on to Cayman Brac. There are very few people at Little Cayman, about 40 ; but at Cayman Brac there are between 400 and 500 inhabitants, living by fishing and cultivation of "ground provisions" (yams, &c.) and bananas. Cayman Brac exports a large number of cocoa-nuts, as much, I was told, as 600,000 to 800,000 annually. The shore is lined with cocoa-nut palms, and there is no disease. A very great number of nuts are, however, destroyed by rats.

Grand Cayman is surrounded by coral reefs, and the shore vegetation is what is usual in such places, but at a short distance from the sea there are signs of an indigenous flora, which would well repay detailed examination. My special work being to inquire into the agricultural products of the islands, I could not devote much time to collecting, and such specimens as I have brought back home have suffered a good deal from want of proper facilities for drying, &c. However, as soon as they are dry I will send them to Kew for determination. I found two orchids, which are well worth cultivating, if you have not already got them. One is a species of *Aëranthus*, like *A. funalis*, but larger and finer, I think. The other is a species of *Schomburgkia*, near *S. crispa*,

but the lip is purplish, not pink red. I enclose flowers only for the present, and if you like I will send some of the living plants, as well as dried specimens.* From what I saw of the interior the soil appeared to be formed by the disintegration of limestone, this red clay and the limestone rock being of the same character as is found to such an extent in Jamaica. Wherever, therefore, it is of any depth it is suitable for cultivation. Mangoes grow well, but they are said not to be so good as some of the Jamaica fruit. Oranges, both sweet and bitter, and a few lemons are produced, and great quantities of limes are exported pickled. Yams, cocoes, sweet potatoes, cassava, pine apples, melons, sugar canes, bananas, guinea grass all grow well. I took a few good pine apple suckers with me, which they were glad to have. The sugar cane looked poor, but they said that it was due to long-continued drought, and that canes grow sometimes from 12 to 15 feet in height. There are a great number of papaw trees, some with thick trunk and several branches; the fruit is usually large. There is a good deal of logwood, fustic mahogany, and hard-wood timbers, which would appear to prove that the island is something more than a mere coral reef. The people are excellent shipbuilders, and use their native mahogany and other hard timbers in the construction of schooners up to 50 tons, but the planking is now at least imported from the States. These hard-wooded trees grow on the north side, but as it was doubtful whether I could go and return in one day, I had to abandon a projected visit. I was sorry, also, not to see the cultivation there, as I heard that the soil was the richest in the island and more cultivation carried on than elsewhere. *Furcræa cubensis* grows, and I believe some attempt has been made to extract the fibre. The Jamaica Keratto (*Agave Morrisii*) is plentiful on all the islands. I saw two trees of coffee growing not far from the sea, and though they were close up to the house, and not pruned, the crop was not a poor one, considering the previous drought. This was probably the first attempt to grow coffee in these islands, and I think that the result justifies planting. The guava and the coco plum grow wild, as in Jamaica.

In little Cayman there is mahogany, but no cedar (*Cedrela odorata*) and in Cayman Brac there is plenty of cedar and scarcely any mahogany, In little Cayman there is no logwood nor fustic ; at least I was told so by the inhabitants, and I met with none. On Cayman Brac I found fustic growing in the woods, but logwood was said not to grow. The interior of Cayman Brac, within the fringe of coral beach, where the cocoa-nut grows, is limestone, disintegrated into hollows which make walking very difficult and dangerous. Wherever sufficient red clay exists provision grounds are made, where the usual "ground provisions," bananas, and pine-apples are grown.

There are considerable deposits of phosphates in these islands, which are being worked at the Grand Cayman.

At Grand Cayman the disease in the cocoa-nut palms appeared somewhere about 15 years ago, and spread throughout the whole island, killing off every single tree. Seed was imported from the mainland, and the inhabitants have been persevering ever since in their efforts to re-establish the former flourishing cocoa-nut walks. Sometimes the trees die while they are quite young, and sometimes a crop is produced

* From an examination of these flowers at Kew, it appears that the *Schomburgkia* is *S. Thomsoniana*, Reich. f., Gard. Chron., 3rd Ser., vol. ii., p. 38 [1887]. The locality of Professor Reichenbach's plant is not stated. The other orchid is probably a new species of *Dendrophylax*, near to the Jamaica plant *Dendrophylax* (*Aëranthus*) *funalis*, Grisebach Flor. Brit. W. Indies, p. 625, but the flower is larger and the spur much longer.

and then the tree is attacked. The disease is quite independent of wind, travelling as often against it as with it, and attacking often the finest trees in a walk. The outer leaves first show signs of the disease, gradually turning yellow; but I invariably found that it was the bud leaves which were affected first at the apex, and as the disease gained ground the outer leaves lost their green colour. Sometimes on cutting the stem right through just above the ground it appeared perfectly untainted and smelt and tasted sweet. At other times, when the disease had made more progress, though the stem section looked white, it smelt and tasted sour, and this occurred even when only the upper portion of the "cabbage" was discoloured. The discolouration was a purplish black, eventually becoming quite black. There was a sour smell as of fermentation in the "cabbage," and, considering all the circumstances, I believe that the disease is due to a bacterium. I had no suspicion of this before starting, as I was told that the disease was the same as the Jamaica scale insect; but even if I had taken material for the purpose of examination, there was not sufficient time to do anything. I have brought back small species in alcohol (diluted), but have not yet examined them under the microscope. The disease is evidently not caused by an insect, but after the disease has taken hold of the tree, and decay has set in, various insects may be found, such as ants, a small beetle (called the cocoa-nut fly), and white larvæ, which may be the cocoa-nut fly larvæ. I did not see a trace of the Jamaica beetle or the scale insect.

W. Fawcett.

LIII.—VALONIA IN CYPRUS.

The following correspondence has passed between this establishment and the Crown Agents for the Colonies on the subject of acorns shipped to this country by the Government of Cyprus as Valonia:—

Royal Gardens, Kew, to The Crown Agents.

Royal Gardens, Kew,
June 4, 1888.

Gentlemen,

I have the honour to acknowledge the receipt of your letter of May 25th, with enclosures (herewith returned), and accompanied by three samples of acorn-cups sent from Cyprus as Valonia.

2. This important tanning material is in large use in this country, as much as 30,000 tons having been imported in 1885. It consists of the acorn-cups of the Valonia Oak, *Quercus Ægilops*, L., and the commercial supply is derived apparently exclusively from Greece and Asia Minor. Valonia from these two sources is commercially distinguishable, and they are produced by distinct local forms of the Valonia Oak.

3. The acorn-cups sent from Cyprus are not Valonia at all, and do not in any way resemble it. One of the samples, in fact, consisted merely of the acorn-cups of the Holm or Evergreen Oak, so commonly planted in this country. I am afraid there is not much prospect of finding any commercial use for these acorn-cups; but Mr. W. N. Evans, of 66, Stackpole Road, Bristol, takes much interest in possible sources of new tanning materials, and I think if samples were sent to him he might be disposed to see if any use could be found for them.

4. In writing to the Colonial Office, April 20th, 1881, I pointed out that Gaudry, in his report on Cyprus to the French Government, expressed his astonishment not to meet with the Valonia Oak in the

island. It could probably be very easily raised from seed, and the Government of Cyprus could hardly do a wiser thing than to raise and plant out year by year a stock of this valuable tree.

I am, &c.

The Crown Agents for the Colonies. W. T. Thiselton Dyer.

The Crown Agents to Royal Gardens, Kew.

Sir, Downing Street, June 16, 1888.

I have the honour to acknowledge the receipt and to thank you for your letter of the 4th instant.

In accordance with your suggestion we have sent samples of the Cyprus acorn-cups to Mr. Evans of Bristol, and I enclose a copy of his report upon them, which we propose to communicate, with a copy of your letter, to the Isiand Government.

I have, &c.

The Director, Royal Gardens, Kew. E. E. Blake.

[Enclosure.]

Mr. Evans to The Crown Agents.

66, Stackpole Road, Bristol,

Gentlemen, June 13, 1888.

I am duly in receipt of your favour of the 9th. The parcel with three samples of acorns came in due course yesterday. I have carefully analysed them, and beg to enclose copy of the analyses, by which you will observe that although they contain very small quantities of tannic acid, yet the per-centage is so small that they would not pay to ship. If my memory is correct, a cargo of some similar acorn-cups was brought into Liverpool a few years since, which was worthless, and thrown overboard in the Mersey. These cups are not Valonia, which is *Quercus Ægilops*, eight or ten times as large, and giving from 25 to 40 per cent. of tannin.

There is no reason why Valonia should not be grown on the island. Fresh *undried* acorns could be got from Smyrna, Aidin, or Borlo districts, or from the island of Rhodes, and no doubt the young plants would flourish there, if they were *enclosed* so that the goats and other animals could not get at them to destroy them. Valonia is and ever will be a precarious crop on the mainland from the insecurity of life and property. It grows on the high grounds to the north of Cyprus, and it might, with little care and attention, form a valuable addition to the products of the country. I would also mention that there is another tanning material, namely "Shumac" (*Rhus Coriaria*), which has been used by the natives in their tanning for centuries.

At the Colonial and Indian Exhibition I encouraged the Commissioner to export it to England in the Sicilian style. There is a very large demand for the best Palermo Shumac, but that is almost perfection. I believe a little encouragement, and the growth of the same kind of Shumac as that grown in Sicily (*R. Coriaria*) would produce the same results. Messrs. J. W. Williamson and Co., Limasol, have sent over some, but are rather discouraged by the lowness of the price, 10*s*. to 13*s*. per cwt.

I shall be pleased at any time to give information on tanning products, or analyse the same.

Yours, &c.
(Signed) W. N. Evans.

Analysis of Acorn-cups from the Island of Cyprus.

No. 1.—*Quercus Pfæffingeri.*

	Per cent.
Tannin - - -	0·80
Organic acids - -	4·02
Water - - -	12·20
Ashes - - -	2·74
Woody fibre - - -	80·24
	100·00 worthless.

No. 2.—*Quercus Ilex.*

	Per cent.
Tannin - - -	2·41
Organic acids - -	4·42
Water - - -	11·44
Ashes - -	2·30
Woody fibre - - -	79·43
	100·00 worthless.

No. 3.—*Quercus alnifolia.*

	Per cent.
Tannin - - -	4·83
Organic acids - -	5·63
Water - - -	11·32
Ashes - - -	2·41
Woody fibre - - -	75·81
	100·00 not pay to ship.

(Signed) W. N. Evans.

LIV.—PRICKLY PEAR IN SOUTH AFRICA.

Professor MacOwan, F.L.S., Director of the Botanic Garden at Cape Town, has obligingly communicated to this establishment a corrected proof of a memorandum prepared by him for the Department of Agriculture of the Cape Colony. This memorandum deals with the circumstances attending the rapid spread of one or more species of *Opuntia* plants, which are familiarly known in warm countries as prickly pears. These plants, native of the New World, are becoming increasingly abundant in all dry regions of the Old World. The land occupied by them is practically useless for all purposes of husbandry, and hence it becomes an important question economically how such plants may be effectually eradicated at a small cost, or, if it is not possible to eradicate them, how they may most conveniently be utilised as objects of productive industry.

Cape Town, 5th April 1888.

Confining what I have to say to experience in the districts of Somerset and Graaff-Reinet, there nevertheless exist, in many other places, large areas over which the prickly pear plant has spread during the last 50 years so as to become a serious difficulty. The courses of streams, and flats between their curvatures, have in many cases been completely over-run, and such places are generally abandoned in despair. Thus there was a noted thicket just below the Bruintjeshoogte pass on the road to Pearston, whose enlargement and increasing denseness I noted during about 10 years. The thicket on the site of the railway station at Cookhuis Drift, though not so large, was even more dense, and although the occupier of the outspan, previous to the construction of the line, laboured hard, during the many years I knew the place, to eradicate the plant, he could do little more than keep clear the area of his garden and mealie [maize] land. Even after the great clearance made, regardless of expense, by the railway department, I observed in 1886–7 that young Opuntiæ were springing up everywhere and bidding fair to recover the lost ground.

I do not think the ordinary means at the disposal of any farmer will be adequate to the extirpation of such concentrated masses of this plant. But where it occurs sporadically—here one, and there one—over the average surface of a sheep-farm, things are not so hopeless. Many enterprising men have, in the districts named, spent from 100*l.* to 200*l.* in one sum to clear their property, and find advantage in the outlay. Stock, I am informed, are apt to get under the lee of a thicket of *Opuntia* in cold windy weather, and, besides the mischief accruing (mostly to goats) from irrepressible nibbling of the needle-armed stem-joints, they are apt to receive in their eyes the spicules knocked off and carried before the wind, in which case violent inflammation, suppuration, and even total blindness may result.

So tenacious of life are the stem-joints, that mere hewing down is useless as a means of extirpation. Two out of three stem-joints cut away and left to chance will root on the side next the earth and start afresh. Remember, we are not here dealing with leaves, as is popularly supposed. The flat slab-like elements of the *Opuntia* are joints of the stem, differentiated truly to perform, in addition, the function of leaves, that is, purposes of assimilation and respiration,—but not the less true stem-elements, and therefore eminently capable of rooting at any point where a callus layer can be formed. It is this tenacity of life that has to be reckoned with. I could give you names of several farmers who have extirpated every *Opuntia* on their river-bounded property by sheer uprooting, and have rid themselves of the pest by simply throwing it, by waggon-loads, into the river when it happened to "come down." Of course, this simply passes the curse on to somebody unknown, living down-stream, and is scarcely to be held as a moral transaction.

Effective ways of Extirpation.—The only effective, cheap, and feasible method, to my knowledge, is to uproot and chop the *Opuntia* into short lengths, to pile the pieces in large rectangular heaps about 10 feet square and 5 feet to 6 feet high, carefully closing the lateral openings as much as possible and battening down the whole heap atop with plenty of large stones. Under these circumstances, the heap soon begins to heat, ferments, and the inner portion rots rapidly away. The outer layers exposed to change of air, resist longer, and when the centre has fallen in, are re-piled on the decayed mass and battened with stones as before. This heroic proceeding is, however, powerless to destroy the seeds, which are singularly horny in texture. I have seen a multitude

of little plants, not a span high, rising from almost every square inch of the site of one of these piles, whence the stones had been removed to repair a kraal, and the wind had dispersed the fibrous residue of the rotted parent plants. This was the increase from the seed in the ripe prickly pears on the plants when first stacked up a year before. It was not without some difficulty that the proprietor was brought to see the probable future of these little villains, and at my earnest solicitation brought up two loads of dry kraal-dung to cover them completely, and enacted such an *Auto-da-fé* over them, by the help of a fire-stick, as effectually prevented all possible mischief thereafter. The moral of this experience is to stack the Prickly Pear for rotting down at the season when it has no fruit in evidence.

The former occupier of the Prickly Pear centre at Cookhuis Drift, being a man of great energy and intelligence, tried to put into practice a plan said to be effective in California for extirpation of the plant. This consisted in feeding the stem-joints or leaves as they are properly called, into a sort of mill, something like a bark-mill, with revolving cylinders armed with interlocking spikes. The *Opuntia* is completely demoralised in the passage through the machine and pours out of the delivery spout in a thick green pulp useless for mischief, useful for the compost heap. The attempt I speak of was made with no more perfect appliance than a small root pulper such as is used for mangolds, but enough was accomplished to show that with a properly adapted machine and sufficient power, an unlimited quantity of *Opuntia* might be destroyed with great rapidity and converted into potential manure.

Value of Prickly Pear as Fodder for Sheep and Ostriches.—I am aware that the plant has been occasionally turned to account in seasons of drought when food and water were equally scarce. But it is essential that the spicules be removed, and this necessity renders the exploitation of *Opuntia* as a food both tedious and costly. There is scarcely another way of utilising it except by very carefully singeing every section at a blazing fire. Certainly every spicule may be thus removed, but as each joint has to be separately picked up, exposed to the flame and turned over, just as in toasting bread, the plan seems amateurish and unpractical. Possibly two brush cylinders running at different speeds might clean off the spicules as aptly as the fire, but the invention has yet to be brought out. Nevertheless I know of a small and very valuable clump of thoroughbred stock in the Karoo saved in a hard season solely by the use of the *Opuntia*, rendered harmless by being well blazed with torches of Kersse-bosch [*Sarcocaulon Patersoni*, D.C.]. After passing through the fire, the sections were thrown into a turnip cutter set to cut very coarse. A little salt sprinkled over the mass made a sapid mess for which the imported ram and his progeny fought like dogs over a bone. I do not think one bit the more for this incident, however, that the plan is practicable on any scale but that of an experiment or a famine-dodge.

What you can do with ordinary appliances for a little lot of, say, twenty head of special stock, is as much out of your reach as a horn of the new moon when you have to find food for, say, fifteen hundred. Still I am far from saying the pestilent *Opuntia* may not be made, by some clever person, to pay for its footing and something more.

In the height of the mania for ostrich raising, which a few years ago supplied the place now taken by gold shares, the *Opuntia* was turned to account for feeding when green food was scarce, and the comparatively small number and greater value per head of the birds as compared with the sheep, made the exploitation of the plant more practicable.

After the usual singeing, the "leaves" were laid singly on a rude revolving table one foot square. On this worked a mechanical arrangement of four blades. A blow of the cutter slashed the leaf into narrow slips, and a half turn of the table presented the material for a second cut at right angles to the former one. Thus the stuff was very rapidly cut up into inch discs, and as rapidly put out of sight by the omniverous struisvogel [ostrich]. I believe I am correct in saying that these novel greens were not found to answer as more than an occasional dietetic change, but produced diarrhœa and other mischief when too freely used. Cooking by a process of steaming is worth a trial.

The Thornless Opuntia.—And here permit me to speak of the thornless or nearly thornless variety of *Opuntia*, known to Colonists as the *Kaal-blad*. This, I suppose, is the cochineal-cactus of Mexico, chosen for its especial value in the cochineal industry, and for the fewness, minuteness, and caducous character of the spicules. Old leaves may be safely handled ; young ones are easily made harmless by simple thrashing with a bundle of besom-riet [rushes, or what at the Cape supplies their place for besoms]. All that the common *Opuntia* may be made by careful manipulation the kaall-blad is, *proprio marte*. That the kaal-blad has not been spread purposely over the length and breadth of the land in otherwise useless wastes is just one of the many things that make one wonder and pity poor Africa. As I have said elsewhere, in a Garden Report, I think, "if by touch of a magician's wand the vast thickets of "Prickly Pear along the Klyn Visch, Melk and Blyde Rivers could be "turned into kaal-blad, there would be small chance of hearing of stock "slowly perishing of combined hunger and thirst." It would be a stand-by till better times, and would be food and drink at the same time, so succulent it is. I have not much of it as a specimen in my garden, but each year since 1883 I sent every bit of it that could be spared to the enterprising Luderitz at Angra Pequina, where it grew excellently. The very last communication from Herr Luderitz, scarce six months before his untimely decease, informed me that a hungry span of oxen, foodless and thirsty, had broken into the enclosure where the cuttings were being grown, and had eaten them up to the last square inch.

My argument, therefore, is very much to this end. If in this Colony and in Australia the thorny *Opuntia* has increased so much as to demand in some places legislative interference and Government expenditure for its extirpation, what store of food material, good enough for an occasional hard time, might not be encouraged to propagate itself in precisely similar localities if the comparatively innocuous and easily manipulated kaal-blad were only known and propagated of all men. And further, since Providence seems determined to spoil South Africa by indulgence what might not be done if mankind had the wit to propagate the infinitely more valuable *Spek-boom* [*Portulacaria afra, Jacq.*] all over the stony randts [ridges] and kopjes [hills] which are its natural habitat, an exceptionally good food, greedily devoured by horned stock and horses, occurring here and there in the greatest abundance, yet never artificially propagated. I can only fall back on my oft-used organ of wonder, and hope that in future years some Africander will arise to make ten spek-booms grow for every one alive to-day.

P. MacOwan.

As supplementing the information contained in Professor MacOwan's Memorandum, it may be mentioned that the plants popularly known as Prickly Pears present unusual difficulty in their determination owing to the confusion which exists as regards their literature. It is very

desirable that a careful study be made of these plants as now existing in different countries, and that, if necessary, a complete set of specimens be prepared and forwarded to Kew for ultimate determination. It might be mentioned that the best method for packing the specimens of the typical stems would be in dry sand, while the prepared and dried flowers and fruits should be accompanied by careful drawings and descriptions.

Species of Opuntia.

Originally natives of the American Continent, inhabiting hot and dry places, the Prickly Pears were doubtless first introduced to the Atlantic islands, such as the Canaries and Madeira, and from these centres they have rapidly spread to the Mediterranean region in one direction and to St Helena, the Cape, and India in another direction. Owing to the facility with which they are propagated by portions of the stem and by seeds they are now established to a greater or less extent in most of the dry regions of both the Old and the New World.

The species more commonly met with in the Old World are *Opuntia Tuna*, L., *O. vulgaris*, Mill., *O. Dillenii*, Haw., *O. nigricans*, Haw., *O. monacantha*, Haw., *O. decumana*, Haw., *O. Ficus-indica*, Mill., and *Opuntia* (*Nopalea*) *coccinellifera*, Mill.

Opuntia Tuna, L., is well described by Lowe in the Flora of Madeira. Vol. I., p. 313. This is a tall plant, more or less spiny, with obovate-oblong or oblong-spathulate joints, two or three times as long as broad. The colour is dull green, with a glaucous tint. The spines are white, varying from one to two and five in a fascicle, and rarely an inch long.

The flowers are diurnal, scentless, and about two inches in diameter and of "a dull tawny reddish-orange or flame colour." The fruit is barrel-shaped, truncate, and widely umbilicate at the top, two or three inches long, and one and a half to two inches in diameter. The colour of the ripe fruit is pale green, with a pale greenish-white pulp. Lowe, an accurate and careful observer, states that this species is the only one employed in the Canaries for raising cochineal. It had existed universally in all the islands long previous to the introduction of the insect. It is recorded by Webb that the first introduction of the insect was violently opposed by the country people on the ground of its rendering the *Tuneras* or Prickly Pear plants barren and injuring the crops of their favourite fruit called Figos, which are even now much used, both fresh and dried.

Opuntia vulgaris, Haw. [Bot. Mag., tab. 2,393] has a low, diffuse stem, generally free from spines; the flower is yellow and the fruit purple.

Opuntia Dillenii, Haw. [*Cactus Dillenii*, Ker in Bot. Reg. IV., t. 255]. A very spiny plant, with a sulphur-yellow flower, slightly streaked on the outside with red, and a purplish pear-shaped fruit, is generally supposed to be the common prickly pear of India. The very slender spines of this plant are used generally in the Canaries for affixing the rags impregnated with the young insect brood to the plants of the true *O. Tuna*, L. Lowe states that the fruit of *O. Dillenii* is scarcely eaten. This species approaches nearest to *O. nigricans*, Haw. [Bot. Mag., tab. 1,557], which, however, has dark brown or black spines. Again the flowers of this latter are of a yellowish colour tinged with red, while the fruit is wholly red.

Opuntia (*Nopalea*) *coccinellifera*, Mill., belongs to an entirely different section of the genus, and is by some writers removed entirely from *Opuntia* and placed under *Nopalea*. The stem is grass green, with obovate oblong stem pieces. The *areolæ* are very distant and at length without spines. The *areolæ* at the summit of a young specimen bear single, recurved, small spines. The flowers are *crimson*, with the stamens exerted and closely surrounded by the bract-like petals.

Prickly Pear in India.

From specimens sent to Kew in 1886 by Mr. Joseph Steavenson, the indefatigable Honorary Secretary of the Agri-Horticultural Society of Madras, it appears that there are three species of *Opuntia*, more or less, common in the neighbourhood of Madras. These are *O. nigricans*, Haw.; *O. Dillenii*, Haw.; and *O. monacantha*, Haw. The latter, according to Professor Oliver (who disagrees with the synonyms in Flora Brit. India), being the Cactus indicus of Roxburgh.

Owing to the immense tracts of country covered wfth Prickly Pear plants in India and elsewhere, various attempts have been made either to eradicate them as recommended by Professor MacOwan, or to utilise them in various ways for industrial purposes. In the way of eradication it was suggested some time ago to the Government of Madras to utilise the Prickly Pear plants in that presidency in the first place as a shelter for tree seeds sown broadcast amongst masses of them. It was hoped to secure the prickly pears as nurses for the tree seedlings, protecting them from the sun and from browsing animals, while the trees when grown up and forming a continuous canopy above would shade the Prickly Pear plants to such an extent as ultimately to destroy them.

In a Report published by the Government of Madras (dated 19 June 1883, No. 1,777) it is stated, as the result of experiments carried on in Trichinopoly, that some margosa (*Melia Azadirachta*) and tamarind seed sown broadcast in patches of Prickly Pear, resulted in the growth of 364 tamarind and 1,886 margosa seedlings. In South Arcot the plan appears to have been in use since 1874. The Deputy Conservator says "there can be no doubt of the results of the system." He refers to an instance where he had established within his district 6,257 seedlings above one foot in girth, and 31,422 less than one foot in girth, all grown on land previously occupied exclusively by Prickly Pears. He further states that the increased shade and moisture from the growing trees had been found ultimately to destroy the Prickly Pear plants.

In other districts in Madras the results obtained have not been so favourable. Where tree seeds of a suitable character are plentiful, and broad-cast sowings are made just before the rainy season, it is possible that the plan would prove effective. It is by no means an economical mode of treatment, and in most countries than India it could not be effectively carried out. Again in dry rainless districts in some parts of South Africa such as those described by Professor MacOwan, the plan would entirely fail.

Cochineal Industry.

As the cochineal insect feeds on species of Opuntia and a large industry is maintained in Mexico and in the Canary Islands to produce the cochineal of commerce, it has naturally suggested itself to introduce the cochineal insects to other countries where plants are abundant.

According to Lowe, as already noted, the only plant used in the Canaries for rearing the cochineal insect (*Coccus Cacti*) is *Opuntia Tuna*, L.

There is little doubt this is the principal cochineal plant, but there is equally little doubt that other species of Opuntia are also used. As the specific name implies *Opuntia* (*Nopalea*) *coccinellifera* is a recognised cochineal plant, and where abundant is preferred to any other on account of the absence of spines. Mueller (*Extra-Tropical Plants*) quotes *O. Hernandezii*, *O. Dillenii*, and *O. missouriensis*, as also serving for the rearing of the cochineal insect. With regard to *O. missouriensis* it is stated that Meehan found plants in North America covered with the cochineal coccus, and verified the fact that the latter could live through the intense cold which characterises the Rocky Mountains of the Colorado regions.

It appears that cochineal culture has been attempted to be introduced to India on several occasions. As lately as 1883 steps were taken by the Government of Madras to obtain broods of insects through the intervention of Sir Lambert Playfair, Consul-General for Algiers. These were shipped from Algiers to Madras to be placed under the care of the Superintendent of the Central Gaol, Coimbatore. On this point it is well to remember that according to Lowe very zealous and careful attempts have been made to establish a cochineal industry at Madeira in the immediate neighbourhood of the Canaries, but even there it has not become permanent. The failure is attributed to the difficulty of preserving or obtaining fresh seed (young insects) to re-stock the plants annually. Any experiments carried on in this direction should be undertaken in a comprehensive manner, and it is evident that a fresh supply of insects would be required annually until successive broods are established on a large scale.

Grafting Prickly Pears.

Dr. Bonavia, of the Indian Medical Service, submitted, for the consideration of the Madras Government, in a letter dated 22nd October 1884, the desirability of introducing from Malta and Italy to India, plants of the best fruit-bearing species of *Opuntia* for the purpose of grafting them on the wild plants found in and around Madras. It is well known that many members of the natural order *Cacteæ* are remarkable for the ease with which they can be grafted on one another. Dr. Bonavia's suggestion was therefore well within the scope of practical effort. Plants obtained from Malta have been supplied by Kew to the Governments of St. Helena and Jamaica with the view of testing the feasibility of grafting Prickly Pears, and so improving the yield of fruit in those islands.

The principal species cultivated in the Mediterranean region for the sake of the fruit are *O. Ficus-indica* and *O. Tuna*. During the season the fruit is consumed in immense quantities, and forms, either fresh or dried, the principal article of food in certain districts. In the *Bulletin de la Société Nationale d'Acclimatation de France*, 4e, vol. v., p. 643, after referring to the wide distribution of *O. Ficus-indica*, which produces *la Figue de Barbarie*, it is stated: "Une autre espèce "également cultivée dans la région méditerranéenne est l'*Opuntia* "*Tuna*, L., ses fruits sont, dit-on, plus volumineux et supérieurs en "qualité à la Figue de Barbarie ordinaire." Large quantities of the Prickly Pear fruit reach this country during the summer months, and they are obtained chiefly from the south of Spain and Malta.*

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* On Edible Cacti, see Gard. Chron., Vol. XXII. n.s., p. 171 (1884).

Alcohol from Prickly Pears.

In a letter to the Foreign Office from Malaga, communicated to this establishment, dated 9th July 1886, Mr. Consul Bidwell draws attention to a Paper read before the Society of Natural and Physical Sciences at Malaga, by Don Fernando de la Cámara, on the cultivation of the Prickly Pear, locally called *Chambos*, and 'the employment of the fruit for the manufacture of alcohol.*

"The Author states that his experiments, which have extended over a period of twelve years, afford most satisfactory results, and he suggests that the cultivation of this plant advantageously takes place in this district, on land hitherto used for vineyards, which may have been destroyed by Phylloxera, or on land which could not otherwise be possibly cultivated."

"The subject matter of the Paper is divided under three headings:—(1) the cultivation of the plants; (2) the process of fermentation; (3) the establishment and cost of the machinery and utensils necessary for the manufacture of the spirit, all of which are minutely treated."

* * * *

"The practical results obtained by the Author in various districts of this Province, from which it appears that a row of plants of 10 metres in length, and two metres in width, produces at maturity, at Malaga, according to the situation, etc., from 2,000 to 4,500 pears or figs annually, or, say, affords an average crop of 2,600 figs per 10 metres."

"These results were obtained in rocky, uncultivated ground, while much better crops are apparently obtainable under careful cultivation."

"The weight of the figs is stated to be about 13 to the kilogramme. From the experiments made for extracting the juice of the fruit it would appear that in a solution of 40 to 45 per cent. the odour and peculiar characteristics are perceptible, but a liquor is obtained, which, it is thought, might be available for drinking purposes as aniseed brandy. During rectification these properties tend to disappear, and in solution of 70 to 75 per cent. the odour is much less apparent, while very little remains at 84 per cent. The average quantity of alcohol obtainable from the liquid is alleged to be eight per cent."

"Minute calculations are contained in the Paper, as well as regards the cost of cultivation as of the expenses of manufacture, which the Author states are the result of long and careful experiments on the subject."

The idea of utilising the Prickly Pear fruit as a source of alcohol is by no means a new one. Sugar has been prepared from the fruit in some countries, and it is well known that alcohol is the direct result of the fermentation of fruit-sugar. The utilisation of the Prickly Pear fruit purely and simply as a source of alcohol is a subject we have no desire to see entertained in our tropical colonies. It is to the credit of mankind that it has not sought indiscriminately for the mere agent of producing the physiological effects of alcoholic stimulation. The immémorial estimation of the fermented juice of the grape would be attributed by no one to the mere alcohol which underlies every variety of wine. We therefore deprecate the idea of preparing alcohol from Prickly Pear for human consumption.

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* Memoria sobre el Cultivo de los Chumbos y su empleo para la Fabricacion del Alchohol, leida en la Sociedad de Ciencias Físicas y Naturales de Málaga por el Socio Don Fernando de la Cámara. Málaga: Imprenta y Libreria de Don Ambrosio Rubio, 1886.

In countries where the fruit is produced in immense quantities advantage might be taken of the circumstance for the purpose of producing alcohol for purely industrial purposes. For instance, for extracting the perfume of flowers by what is known as the Myrogene process alcohol is an essential element. In most colonies alcohol suitable for such a purpose is obtained with great difficulty, and at prices which is practically prohibitive.

If alcohol from Prickly Pear is capable of being rectified so as to be suitable for perfumery purposes a very extensive field of usefulness is open to it. It might also be utilised for preserving fresh fruit for export purposes, and indeed there are endless ways in which it might be rendered capable of assisting the growth of local industries.

Silo Experiments.

In Southern India the stems of Prickly Pear plants (presumably denuded of their spines and bristles) have been successfully preserved in silos. A fluid which copiously exuded from the stems under these circumstances was analysed by the Government Quinologist at Ootacamund. It was found to consist of gum, albuminous substances, and sugar, with traces of tannin and starch. It was considered by Mr. Hooper that mixed with grass this product of incipient fermentation of the Prickly Pear stems would have no injurious effect on cattle, but on the contrary, would prove to be a valuable addition to their regular supplies of fodder.

LV.—STAR ANISE.

(*Illicium verum*, Hook. f.)

The following interesting account of the true Star Anise of China has been prepared by Sir Joseph Dalton Hooker, late Director of the Royal Gardens, for the current issue of the Botanical Magazine [July 1888]. By the courtesy of the publishers, Messrs. Lovell Reeve and Co., we are enabled to give a reproduction of the drawing of the plant from a specimen growing at Kew, to which has been now added a drawing of the mature fruit :—

"The plant producing the true Star Anise of China is here for the first time figured and described. For many years the fruit so called was supposed to be that of *Illicium anisatum*, Linn. (*see* Bentl. and Trimen, Med. Pl., vol. i. t. 10), the Skimmi of Japan, or of *I. religiosum*, Sieb. and Zucc. (Tab. nost. 3965), supposed to be a native of China, but which is identical with *I. anisatum* of Linnæus and Loureiro. For an account of this plant, its history and characters, I must refer to Baillon's learned treatise, published in 1867, in his Adansonia (vol. viii., p. 1), and to papers by the late Dr. Hance and Dr. Bretschneider in the China Review (vol. ix. p. 283, &c.). It suffices here to observe that *I. anisatum* or *religiosum* are species with peduncles bracteate at the base, and long spreading inner perianth-segments, and that they hence belong to a different section of the genus from *I. verum*."

"The first person to recognise the fact that neither *I. anisatum* of Linnæus or of Loureiro could be the true Star Anise of China was Dr. Bretschneider, then Medical Officer to the Russian Embassy at Pekin, who drew attention to the fact that the Japanese plant was a reputed

poison; and that this had been confirmed by T. F. Eykman, who in a paper published in 1881 in the Mittheilung der Deutsche Gesellschaft für Natur- und Völkerkunde Ost-Asien (Heft xxiii. 23) had experimented with and given the name of Sikimine to the poison. But the first definite information regarding the true Star Anise is contained in a letter addressed to me by the late Dr. Hance in October 1881, which contained seeds of the true plant received that morning from Pakhoi, in South China. And in the same year Mr. Ford, of the Hong Kong Botanical Gardens, sent to Kew fruit and fragments of the leaves of the true plant from Pakhoi. In his Report on the Hong Kong Botanical Gardens for 1882, Mr. Ford states that Mr. Kopsch, Commissioner of the Chinese Imperial Maritime Customs at Pakhoi, had obtained for him a few seedlings of the true Star Anise, of which three had survived, and had attained a height of nine feet in 1886, and flowered in the Botanical Gardens. He adds that they prove to belong to an entirely different species from *I. anisatum* and all other described species. In 1883 Mr. Ford sent living plants to the Royal Gardens, Kew, which flowered in November 1887, and it is from one of these that the figure here given was drawn. In 1886 Mr. Ford sent dried specimens from his nine feet high plant."

"There are several species of the genus *Illicium* to which *I. verum* is more nearly allied than to *I. anisatum*, all having globose flowers, but all differing from *verum* in the increased number of perianth-segments, stamens, and carpels; these are the Indian *I. Griffithii*, H. f. and T., and *I. majus*, H. f. and T., respectively from the Khasia Mountains in Eastern Bengal, and the mountains of Tenasserim, and the *I. cambodianum*, Hance (in Trimen's Jour. Bot., 1876, p. 240, *I. cambodgianum*, Pierre, Flore Forestière Cochinchin, t. 4). The latter, a broad-leaved species with long-peduncled flowers, is a native of the Elephant Mountains in Cochin China. From all these *I. verum* differs, not only in the number of parts of the flower, but as Mr. Holmes (Conservator of the Museum of the Pharmaceutical Society), who has been so good as to examine them all for me, informs me, in taste of foliage and fruit, by which alone he could distinguish them, and pronounce *I. verum* to be specifically distinct from all others."

"With regard to Loureiro's *I. anisatum*, from South China, under which he cites Linnæus and the Japanese Skimmi of Kæmpfer, it is altogether a doubtful plant. It is described as having yellow flowers, a six-leaved calyx, spreading corolla, and thirty stamens, and hence cannot be *I. verum*."

"In his 'Notes on Botanical questions connected with the export trade of China,' printed at Pekin in 1880, Dr. Bretschneider calls attention to a Report by Mr. Piry on the trade of Pakhoi for 1878–9, which contains interesting particulars regarding the Star Anise. Of this he says it is brought to that port for exportation from the province of Kuangsi *viâ* Kin-chow, and that it is produced in two districts, Lung-chow on the borders of Annam, and Po-se in the West (or Canton) river close to Yunnan."

"The Star Anise was, according to Hanbury (Pharmacographia, ed. 2, p. 22), first brought to Europe by the voyager Candish about the year 1588, and was first described by Clusius (Rarior .Plant. Hist. p. 202) in 1601 from fruits procured from London. It seems afterwards to have been imported *viâ* Russia (and hence called *Cardamomum siberiense*, or *Annis de Siberie*), and was used by the Dutch in the seventeenth century to flavour beverages. From China it is exported into Eastern Turkestan under the name of Chinese fennel, and in China itself it is called Pa kio nui hiang, or eight-horned Fennel; the fact being that

M.S. del, C.H. Fitch lith.

Vincent Brooks, Day & Son Imp

Illicium verum Hk. f.

L. Reeve & Co. London.

though commonly compared with aniseed, the taste is really more like that of fennel; so that the name given to it by Redi (Experimenta, p. 172) in 1675 was *Fœniculum sinense*. In China the Star Anise is employed as a condiment and as a spice, and it is still used to flavour spirits in Germany, France (where it is the flavouring materia of Anisette de Bordeaux) and Italy. In England, according to Hanbury, it is used only as a substitute for oil of anise."

"The propriety of giving the new name of *verum* to this interesting plant may be challenged on the ground that the Linnæan one of *anisatum* should be retained for it, and another be adopted for the Japanese plant so long supposed to be the origin of the Star Anise. The objections to this course are twofold: the first is, that Linnæus (Sp. Plant. Ed. 3, p. 664) clearly describes this as his *I. anisatum*, the Skimmi of Kæmpfer, and cites Kæmpfer's Amœnitates for the same. He, however, adds, "Planta a me non visa, fide Kæmpferi recepta, *forte Anisum "stellatum officinarum*, quod adjectum Tetraodonti ocellari ejus auget "venenum." The italics are my own. The passage shows that Linnæus is not answerable for the reference of the Star Anise to *I. anisatum*. The second objection is, that it would require the adoption of another name for the old and well-known Japanese plant, for which, however, the synonym *I. religiosum* of Siebold and Zuccarini might be adopted.—*J. D. Hooker*."

Explanation of Plate.

Fig. 1, Flower. Fig. 2, front view of stamen. Fig. 3, back view of stamen. Fig. 4, the carpels. Fig. 5, side view of single carpel :—all enlarged. Between Figs. 1 and 4 is represented the mature fruit.